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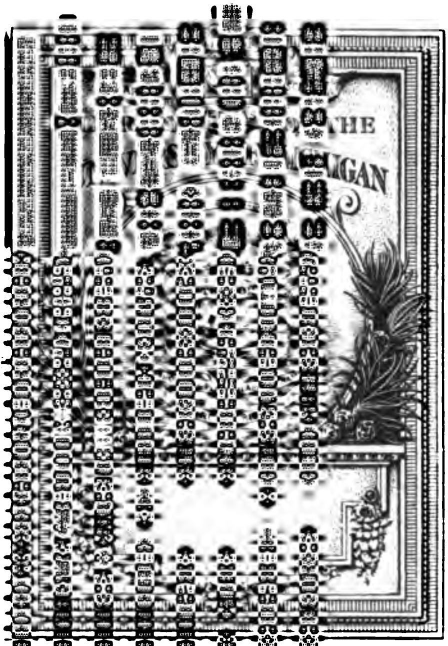
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A REVIEW

OF

Our Present Knowledge

OF THE

Molluscan Fauna of Michigan,

BY

BRYANT WALKER.

Read before the Michigan Academy of Science,
December 27, 1894.

DETROIT:
THE THOS. SMITH PRESS, 40-42 LARNED STREET WEST.
1895.

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A REVIEW OF OUR PRESENT KNOWLEDGE

OF THE

MOLLUSCAN FAUNA OF MICHIGAN.

BY BRYANT WALKER.

I.

Barring a few scattering descriptions by European naturalists of such species as were brought home by the early travellers in this country, the history of North American conchology may be said to have begun when Thomas Say, in 1817, wrote the article on "Conchology" for the first American edition of Nicholson's Encyclopedia of Arts and Sciences. Philadelphia then, as now, was the centre of activity in this branch of science in the United States, and in the proceedings of the then newly organized Academy of Natural Science and a few other scientific and literary publications of that city, nearly all the conchological writings for the next twenty years are to be found.

Michigan, as such, had no distinctive name in those days, and was known only as a wilderness filled with swamps and savages and located somewhere in that still greater and more indefinite region called the northwest.

But as population increased and young blood from the New England states made itself felt in the new territory, there began a dawn of better things. And one of the first acts of the first legislature of the new state of Michigan in 1837 was the establishment of a State Geological Survey with Douglas Houghton at its head as Geologist and Dr. Abram Sager as Zoologist. Dr. Sager, who in after years became so well known in the medical department of the State University, and who had already in 1836 supplied Conrad with material for his monograph of the *Unionidæ*, entered with activity upon the duties of his position and in 1839 published the first paper upon Michigan conchology. It is simply a list of species, 76 in number, one of which was not identified. It is dated January 12th, 1839, and is to be found in the Documents of the House of Representatives for 1839 at page 410.

In 1859, the Legislature passed an Act entitled "An Act to finish the Geological Survey of the State." The late lamented Prof. Alexander Winchell was appointed State Geologist and Prof. Manly Miles, who is still with us, State Zoologist.

The first report bears date December 31st, 1860. It contains in addition to other faunal lists, a catalogue of 161 species of shells, two of which *Planorbis truncatus* and *Unio leprosus* are described as new.

In the years, which had intervened between the publication of these catalogues, in addition to such scientific activity as centered around the labors of Dr. Sager and Prof. Winchell at the University, a little band of active collectors residing at Grand Rapids had done much to develop the fauna of the western part of the state. Alfred O. Currier, John A. McNeil, W. H. DeCamp and L. H. Streng were the leaders.

Mr. Currier came to Grand Rapids in 1850 from Troy, N. Y., where he had become fascinated with the study of conchology from being associated with that eminent conchologist, the late Dr. Wesley Newcomb. He died in 1880 and his extensive collection became the property of the Kent Scientific Institute of Grand Rapids. He published in 1859 (?) a "List of Shells Collected in the Grand River (Mich.) Valley," and in 1865 a "Catalogue of the Mollusca of Grand Rapids, Michigan." In 1867 he published descriptions of four supposed new species from this state in the American Journal of Conchology, III, p. 112. In 1868 he published as No. 1 of the Miscellaneous Publications of the Kent Scientific Institute, an elaborate "Catalogue of the Shell-bearing Mollusca of Michigan." This list was by far the most complete yet published and enumerated 171 species and 6 varieties.

Dr. DeCamp came to Grand Rapids in 1855. In the congenial company of Mr. Currier he turned aside from botanical and geological work, which had previously enlisted his attention, and from that time has devoted his leisure hours almost wholly to the study of our local mollusca. He has accumulated a large and valuable collection, and his time and specimens have always been at the service of his fellow collectors. In 1881, Dr. DeCamp, under the auspices of the Kent Scientific Institute, published a "Catalogue of the Shell-bearing Mollusca of Michigan," in which, in addition to the list of 221 species and 9 varieties, he figured and described three species named by Mr. Currier, but never formally described.

In 1856, Mr. John A. McNeil settled in Grand Rapids, and became interested in the subject through Mr. Currier and Dr. DeCamp. He remained there as an active and indefatigable collector until 1870, when he left and made collections in Central and South America a specialty. He died some three years ago at Binghampton, N. Y.

Mr. Streng, who has been a resident of Grand Rapids since 1870, began to collect as far back as 1850, when a resident of Saugatuck and is still actively engaged in the pursuit of his favorite study.

I am not aware that either of these gentlemen have ever published anything upon their Michigan collections. But Prof. Miles acknowledges the assistance afforded him by Mr. McNeil in the preparation of his catalogue. And Mr. Anthony was also indebted to him for some of the material from which he described a number of Michigan species, and, indeed, named one of them after him. The writer has elsewhere had occasion to express his obligations to Mr. Streng for much generous assistance in compiling his previous catalogues of the shells of the state.

In 1879, the writer published a "Catalogue of the Shell-bearing Mollusca of Michigan" in the Journal of Conchology and in 1892 a second list in the Nautilus.

In addition to the two papers by Mr. Currier, already referred to, the following local lists have been published:

In 1872-3, Mr. Sidney I. Smith published "A Sketch of the Invertebrate Fauna of Lake Superior."

In 1876, Mr. C. E. Beecher and myself compiled for the Ann Arbor Scientific Association a list of the species found in that vicinity.

And in 1893, I published "A List of the Shells of the Saginaw Valley," based upon the collection of the late Dr. George A Lathrop.

In addition to these papers, which are devoted entirely to the shells of the state, many scattering references to our fauna are to be found in the writings of nearly all the prominent conchologists of this country. A full list of these will be found in the bibliography appended to this paper. Among them, however, are some worthy of special mention.

In 1836, T. A. Conrad in his "Monography of the Unionidae" published descriptions of three supposed new forms from Michigan, viz: *Unio ellipsiformis*, *U. Sageri* and

U. gibbosus var. perobliquus. The first of these species has never been identified by subsequent collectors and is probably the same species described in 1845 by Lea as *Unio spatulatus.* Unfortunately some of the details of Conrad's description are such, owing probably to the imperfect character of of his specimens, as to prevent the union of the two species.

In 1847, William Case described in the American Journal of Science, a remarkable species of *Planorbis*, brought by Captain Stanard from Northern Michigan, under the name of *P. multivolvis.* The exact locality was not given. According to Binney a single specimen presented by Dr. Gould to the Smithsonian Museum was the only one known to him. Sowerby, in the "Conchologia Iconica," figured another form of the same species. I have not had an opportunity of examining that publication to obtain further details in regard to the specimen figured, but it would seem that at least one other example had reached England. For many years nothing further was known of the species. Kuster in his monograph of the *Limnæidæ*, published in 1886, copied Sowerby's figure, and after criticizing both figures severely, pronounced it, in his opinion, an abnormal form of the common *Planorbis campanulatus* Say. Finally, however, in 1887, Dr. M. L. Leach found the long lost species in great abundance in Marl Lake, in Roscommon county. These specimens agree perfectly with the original figures, and while examples from other localities seem to connect the typical form with *P. campanulatus*, it is at least a well marked variety, and of great interest, not only from its peculiar form, but from its remarkable history.

The naturalists connected with the celebrated expedition of Prof. Louis Agassiz to Lake Superior in 1848 found some seven new species of mollusca, two of which *Limnæa lanceata* and *Physa vinosa* were described by Dr. A. A. Gould, and the remainder, *Sphærium aureum*, *emarginatum*, *flavum* and *tenue* and *Pisidium rotundatum* by Temple Prime. The locality of most of these forms is given simply as Lake Superior, but they have been included in the catalogues of both Currier and DeCamp. Some of them have since been definitely determined to be inhabitants of the state, and the remainder probably will be also.

In 1857, Dr. Isaac Lea (Proc. Acad. Nat. Sci. Phil. IX p 84) described the *Anodonta modesta* from specimens found near Kalamazoo.

In 1865 and 1866, John G. Anthony in the American

Journal of Conchology described twelve new species of *Anodonta* and one *Unio* from Michigan. Of these but one, the *Anodonta subgibbosa*, is considered by Dr. Lea in his last "Synopsis" to be a valid species.

In 1865, George W. Tryon, Jr., described a new species of *Limnæa*, the *L. zebra*, from specimens from Michigan, Minnesota and Wisconsin. It is now considered to be a color variety of the *L. reflexa* Say. And in 1866, the same author described the *Succinea DeCampii* from specimens discovered near Marshall in this state.

The growth of our knowledge of the molluscan fauna of the state during the fifty-five years which have elapsed since the first catalogue was published is shown by the following synopsis of the number of spicies listed in catalogues of Sager (1839), Miles (1860), Currier (1868), DeCamp (1881), and the present one (1894). In arranging it all those species, whose occurance in the state is considered doubtful for reasons hereinafter given, and all synonyms and varieties have been eliminated.

SUMMARY.

		Land.	F. W. Pulmonates.	F. W. Operculates.	Bivalves.	Total
Sager,	1839,	22	10	6	30	68
Miles,	1860,	44	24	14	57	139
Currier,	1868,	44	36	12	57	149
DeCamp,	1881,	48	41	27	69	185
Walker,	1894,	71	49	34	96	250

There have been up to the present time 42 species and varieties listed from this state as new to science. They are as follows:

Polygyra palliata alba Currier, Mss.
Vertigo Morsei Sterki.
Succinea DeCampi Tryon.
Limnæa stagnalis Sanctæ-Mariæ Walker.
    reflexa scalaris Walker
    palustris Michiganensis Walker.
    intertexta Currier, Mss.
    contracta Currier.

- *Physa Parkeri* Currier.
  - *deformis* Currier.
- *Aplexa Tryoni* Currier.
- *Planorbis truncatus* Miles.
  - *multivolvis* Case.
  - *bicarinatus corrugatus* Currier Mss
  - *bicarinatus major* Walker.
  - *costatus* DeTar & Beecher, Mss.
- *Valvata striata* Lewis.
- *Campeloma decisa flava* Currier, Mss.
  - *decisa melanostoma* Currier, Mss
  - *gibba* Currier.
  - *Milesii* Lea.
- *Goniobasis Milesii* Lea.
- *Unio ellipsiformis* Con.
  - *Sageri* Con.
  - *perplexus perobliquus* Con.
  - *leprosus* Miles.
  - *opalinus* Anth.
- *Margaritina rhombica* Anth.
- *Anodonta inornata* Anth.
  - *McNeilii* Anth.
  - *opalina* Anth.
  - *flava* Anth.
  - *glandulosa* Anth.
  - *imbricata* Anth.
  - *irisans* Anth.
  - *pallida* Anth.
  - *subinflata* Anth.
  - *subangulata* Anth.
  - *subgibbosa* Anth.
  - *subcarinata* Currier.
  - *Houghtonensis* Currier.
- *Sphærium flavum* Prime.

Of these the following have never been described formally, but have appeared by name simply in the different catalogues:

- *Polygrya palliata alba* Currier.
- *Limnæa intertexta* Currier.
- *Planorbis bicarinatus corrugatus* Currier.
- *Campeloma decisa flava* Currier.
  - *decisa melanostoma* Currier.

Of the remainder the majority, by reason of the increase of our knowledge of the variability of the species, have

been already reduced to either varieties or synonyms. These are *Succinea DeCampii* Tryon=*S. ovalis* Gld,
Physa Parkeri Currier=*P. Lordi* Bd.
Aplexa Tryoni Currier=*A. hypnornum* L.
Valvata striata Lewis=*V. sincera* Say.
Campeloma gibba Currier=*C. rufa* Hald.
Milesii Lea=*C. subsolidum* Anth.
Unio Sageri Con.=*U. rectus* Lam.
leprosus Miles=*U. rectus* Lam.
opalinus Anth=*U. novi-eboraci* Lea.
Margaritina rhombica Anth.=*A. edentula* Say.
Anodonta inornata Anth.=*A. decora* Lea.
McNeilii Anth.=*A. Footiana* Lea.
opalina Anth.=*A. Footiana* Lea.
flava Anth.=*A. fragilis* Lam.
glandulosa Anth.=*A. fragilis* Lam.
imbricata Anth.=*A. fragilis* Lam.
irisans Anth.=*A. fragilis* Lam.
pallida Anth.=*A. fragilis* Lam.
subcarinata Currier=*A. fragilis* Lam.
subinflata Anth.=*A. Maryattana* Lea.
Houghtonensis Currier=*A. Maryattana* Lea.
subangulata Anth.=*A. ovata* Lea.
[illegible] *perobliquus* Con.=*U. sulcatus* [illegible]

II.

According to W. G. Binney, the leading authority on North American land shells, all that part of the continent east of the Rocky Mountains and north of Mexico, forms a single zoölogical province known as the Eastern Province. This again is divided into three regions; Northern, Interior, and Southern. The Northern Region comprises British America and that part of the United States lying east of the Appalachian chain of mountains, while the Interior Region extends from the north region south to the alluvial lands lying along the Gulf of Mexico, Roughly speaking, the dividing line between the Northern and Interior Regions west of the Appalachian chain is the political boundry between Canada and the United States. But practically there is no hard and fast dividing line, and one region gradually merges into the other. In the region of the Great Lakes, however, it would seem probable that the limits are more sharply defined.

Of the thirty-two species given by Binney as characteristic of the Northern Region, eight are peculiar to Greenland and Alaska. Of the remaining twenty-four, nineteen have been found in Michigan. While of the sixty-nine species belonging to the Interior Region forty-eight are known to inhabit this state. That is of sixty-seven Michigan species, nineteen or a little less than one-third belong to the northern fauna and forty-eight to the interior fauna. The addition of the four species not included in Binney's list would not perceptably change the proportion. This is what would be naturally expected from the position of the state upon the northern border of the Interior Region and its very considerable longitudinal extent.

The-seventy one species included in the present catalogue are divided among eleven families and sixteen genera as follows:

Family.	Genus.	Sub-Genus.	Section.	No. of Species.
Selenitidæ	Selenites			1
Limacidæ	Limax			1
Vitrinidæ	Vitrina			1
Zonitidæ	Zonites		Mesomphix	3
			Hyalina	11
			Conulus	1
			Gastrodonta	2
Tebennophoridæ	Tebennophorus			1
Endodontidæ	Pyramidula	Pyramidula s. s.	Planogyra	1
			Goniodiscus	2
		Patula		2
		Helicodiscus		1
	Punctum			1
Helicidæ	Polygyra		Triodopsis	12
			Stenotrema	3
	Acanthinula		Zoögenites	1
	Vallonia			3
Pupidæ	Strobilops			2
	Pupa	Pupilla		1
		Leucochila		1
		Columella		1
		Bifidaria	Privatula	1
			Albinula	2
			Vertigopsis	2
		Angustula		1
	Vertigo	Vertigo s. s.		6
Stenogyridæ	Ferussacia			1
Succineidæ	Succinea			4
Auriculidæ	Carychium			2
			Total. . . .	71

The fluviatile fauna of the state includes representatives of six families and sixteen genera of univalves and two families and five genera of bivalves. Of the univalves two families and six genera are pulmoniferous and four families and ten genera are branchiferous and operculate. The following is a list of the families and genera with the number of species belonging to each.

Family.	Genus.	No. of Species.
Limnæidæ	Limnæa	18
	Planorbis	10
	Segmentina	2
	Ancylus	5
Physidæ	Physa	11
	Aplexa	3
Valvatidæ	Valvata	2
Viviparidæ	Campeloma	5
Hydrobiidæ	Bythinia	1
	Bythinella	4
	Somatogyrus	1
	Amnicola	5
	Lyogyrus	1
	Pomatiopsis	2
Strepomatidæ	Pleurocera	5
	Goniobasis	8
Unionidæ	Unio	42
	Margaritina	5
	Anondonta	18
Corbiculidæ	Sphaerium	19
	Pisidium	12
	Total, . . .	179

The characteristic features of this fauna are best recognized by a comparison with those of other states. I have selected for that purpose Maine, New York, Indiana and Alabama, and have compiled the following table from the latest catalogues to which I have access.

STATE.	CATALOGUE.	Land species.	Auriculidæ (except Carychium.)	Limnæidæ Physidæ	Valvatidæ	Rissoidæ	Viviparidæ	Strepomatidæ	Unionidæ	Corbiculidæ	Total fluviatile species
Maine	Morse, 1864.	48	2	26	2	4	1	0	10	12	57
New York	Lewis, 1874.	64	2	33	2	5	4	7	52	20	123
Michigan	Walker, 1894.	71	0	49	2	14	5	13	65	31	179
Indiana	Call, 1893.	47	0	12	1	2	9	20	95	7	146
Alabama	Lewis, 1876.	77	1	20	0	5	17	302	256	7	608

From an examination of these figures it will be noticed:

1st:—That the total number of species increases rapidly as we proceed from east to west and thence toward the south, The apparent exception in regard to Indiana must, I think. be attributed rather to the lack of knowledge in regard to the extent of its fauna than to its actual paucity.

2nd:—That this increase is to be found almost wholly in the aquatic forms. This is shown not only by a comparison of the faunas of the different states but by the ratio in each state. Thus in Maine the land and fluviatile species are nearly equal; in New York the proportion is about 1 to 2; in Michigan 1 to 2½; in Indiana 1 to 3 and in Alabama 1 to 8. So also, while the increase in land fauna in Michigan and Alabama is about one half more that of Maine, in the aquatic species the increase is in Michigan is about 3½ times and in Alabama nearly 6 times.

3rd:—That this increase varies greatly in different families and between the northern and southern states is wholly confined to three: the *Viviparidæ*, *Strepomatidæ* and *Unionidæ;* the rest suffering a radical reduction. It follows that while the *Viviparidæ*, *Strepomatidæ* and *Unionidæ* are thus shown to be essentially southern in their distribution, the *Limnæidæ*, *Physidæ* *Valvatidæ*, *Rissoidæ* and *Corbiculidæ* are equally characteristic of the northern states.

4th:—Another interesting fact is developed upon examination of the distribution of three genera belonging to the *Unionidæ* in the states above mentioned they are found as follows:

	Unio.	Margaritina.	Anodonta.
Maine,	3	2	5
New York,	34	6	12
Michigan,	42	5	18
Indiana,	73	8	14
Alabama,	238	13	5

From this it appears that while the genus *Unio* has evidently its metropolis in the south where it is enormously developed, the *Margaritinæ* vary but little, and the *Anodontæ* reach their maximum in the north. Thus while in *Unio* the proportion of Michigan to Alabama is about 1 to 6, in *Anodonta* the rate is reversed and is almost as much as the other way, i. e., 4 to 1.

The prominent features of our Michigan fauna then are the relative predominance of the *Limnæidæ*, *Physidæ*, *Rissoidæ* *Corbiculidæ* and *Anodontæ* and in comparison with eastern states a large increase in the species of every family except the *Valvatidæ* and *Viviparidæ*.

This result is what might be expected from the situation and physical characteristics of the state. Surrounded on three sides by the great lakes, and with more than 5,000 small lakes with innumerable rivers and streams flowing into and out of them, and lying far enough north to afford a congenial habitat to the cold-water loving *Limnæidæ*, *Physidæ*, *Rissoidæ* and *Corbiculidæ*, many of whose species are circumpolar, Michigan stands pre-eminent in the number of species belonging to these families found within her borders, and there is every reason to believe that future investigation will tend to increase rather than diminish the list.

III.

But while the general features of our fauna are well enough known to enable it to be said that the present list of species will not probably be very largely increased in the future, yet it must be confessed that our present knowledge is very fragmentary, and requires much to be done before the perfect monograph of our mollusca can be written.

Large areas of our state are, as yet, almost wholly unexplored. The upper peninsula is practically a *terra incognita* to the conchologist. The authority for many of the species catalogued rests solely upon their occurance at a single locality. Nor can it be said that the limits of the range north and south, east and west, of a single one of our 250 species are definitely and exactly known. With a part of our fauna coming to us from the north and east, and another part from the south and west, the accurate knowledge of the range of the different speeies over the state would enable us to solve many interesting questions relative to the origin and distribution of our mollusca. As an example of this, it may be stated that from our present information the rivers and lakes tributary to Lake Michigan appear to have a richer fauna than those that flow toward the east. These species belong mostly to the *Strepomatidæ* and *Unionidæ*, the characteristic families of the Mississippi Valley fauna. If this is found to be true, it would be in accord with the theory of the geologists, that, toward the end of the glacial period the great lakes had their outlet to the south into the Mississippi Valley, and tend to show that during that period these forms made their way north into Lake Michigan, and thence into its tributaries, but for some reason were prevented from effecting a lodgment in the eastern drainage of the state. Another interesting fact in the same connection is the recent discovery in the drift, near Toronto, Canada, of several Mississippi Valley species not now extant in the lake region.

The existence of these species in Canada, and their subsequent extinction may have "an important bearing upon the theory of a mild inter-glacial period, preceded and followed by an advance of the ice. If the ice receded to the vicinity of Toronto, allowing these Mississippi species to attain to that region, the fact that they did not establish themselves there would be easily accounted for by the subsequent advance of the ice and the extinction of the colony. The final melting and disappearance of the ice cap, being complicated by changes in the direction of the drainage, might not afford a second opportunity for the immigration of the species in question." (Simpson).

The first step towards the successful accomplishment of this purpose must be in the encouragement of local field work. Every local catalogue is a direct contribution to science whose value is only limited by the accuracy and thoroughness of the work it represents. The instruction in natural science which is, of late, becoming more and more incorporated with our public school system, could with great profit both to teacher and pupil be turned in the direction of this practical work. There are few branches of natural history better adapted for this purpose than conchology. The material is everywhere abundant and of great variety. It is easily collected and easily prepared for the cabinet and when once in suitable condition requires no further anxiety from its fortunate possessor. Then too, the technical literature required for this work is not extensive, and can be easily obtained. With the exception of the *Unionidæ*, the various monographs published by the Smithsonian Institution contain practically everything that is necessary for the work of the ordinary collector, and these can be obtained without any great expense.

Then again, with the exception of the larger species of land mollusks, practically nothing is known of the development, life history and anatomy of even our most common species. Here is a most fruitful field for original investigation, which, now for many years, has been waiting for some new Say to immortalize himself by the elucidation of its problems.

The work done in the past in this state has been necessarily fragmentary, and it must continue to be so in the future, until such time as, under the direction of some supervising body of recognized authority, individual effort can be systematically organized and directed upon some well defined plan, which shall include the whole state.

It would be exceedingly desirable, if under the stimulus, which it is hoped will be given to scientific matters in Michigan, by the organization of this society some such work could be set on foot as has been so successfully done by the Conchological Society of Great Britain and Ireland.

That organization in 1883 began a record of all localities in the British Isles from which the various species of mollusca were authentically known. For this purpose a committee was appointed of competent members, whose duty it was to keep an accurate record of every species. No record was allowed unless the locality where found was vouched for by some member or correspondent of the society, and the actual specimens were before the committee so that there could be no question as to indentification. Under this system, during the ensuing ten years, over 31,000 records were made. While, of course, the details might have to be modified to meet the peculiar requirements of the work here, some scheme for similar work in this state would undoubtedly do much to stimulate interest and extend our knowledge.

But above all other things, what is needed in Michigan, is a complete biological survey of the state, conducted upon scientific principles and by scientific men under state auspices. This would naturally involve the establishment of a great state museum containing the results of the survey and the accompanying laboratories required to work up the material thus obtained. That this will come some time, I, for one, have no doubt, and I believe that this society should shape its policy with this end in view, and with this purpose collectively and individually seek to accumulate material in every branch of science, so that when the survey is established, and the natural history of Michigan comes to be written, we may all have our share in making it worthy of the great state we are proud to call our home.

CATALOGUE

OF THE

MOLLUSCA OF MICHIGAN.[1]

		S	A	C	D	W
1	Selenites concavus Say	x	x	x	x	x
2	Limax campestris Binn					x
3	Vitrina limpida Gld					x
4	Zonites fuliginosus Griff	x	x	x	x	x
5	ligerus Say	x	x	x	x	x
6	inornatus Say	x	x			
7	cellarius Mull					x
8	nitidus Mull			x	x	x
	hydrophila Ing		x	x 2		
9	arboreus Say	x	x	x	x	x
10	radiatulus Alder					x
	electrinus Gld		x	x	x	
	viridulus Mke					x
11	indentatus Say		x	x	x	x
12	limatulus Ward		x	x	x	
13	minusculus Binn		x	x	x	x
14	milium Morse					x
15	Binneyanus Morse					x
16	ferreus Morse					x
17	exiguus Stimp			x	x	x
18	fulvus Drap					x
	chersinns Say		x	x	x	
19	suppresus Say				x 3	x
20	multidentatus Binn			x	x	x
21	Tebennophorus Carolinensis Bosc					x
22	Patula alternata Say	x	x	x	x	x
	alternata alba Tryon			x	x	x
23	solitaria Say	x	x	x	x	x
24	Pyramidula perspectiva Say	x	x	x	x	x
25	striatella Anth		x	x	x	x
	striatella alba					x
26	asteriscus Morse					x
27	Helicodiscus lineatus Say		x	x	x	x
28	Acanthinula harpa Say					x
29	Punctum pygmæum minutissimum Lea					x
30	Helix virgata DaCosta* 4					x
31	Polygyra Mitchelliana Lea					x
32	clausa Say* 5	x	x	x		
33	multilineata Say	x	x	x	x	x
	multilineata alba			x	x	x
	multilineata unicolor			x	x	x
34	thyroides Say	x	x	x	x	x
	thyroides bucculenta Gld				x	x
35	albolabris Say	x	x	x	x	x
	albolabris dentata Say			x	x	x
	albolabris rufa DeKay				x	
	albolabris maritima Pils					x
	albolabris Traversensis Leach Mss 6.					
36	exoleta Binn		x	x	x	x
	zaleta Say	x				
37	elevata Say	x	x	x	x	x
38	profunda Say	x	x	x	x	x
	profunda alba					x

		S	M	C	D	W
39	Polygyra Sayii Binn		x	x	x	x
40	hirsuta Say	x	x	x	x	x
41	monodon Rack		x	x	x	x
	monodon fraterna Say	x	x	x 2	x	x
42	Leaii Ward			x	x	x
43	tridentata Say	x	x	x	x	x
44	fraudulenta Pils					x
	fallax Say	x	x	x 2	x	x
45	inflecta Say	x	x	x	x	x
46	palliata Say	x	x	x	x	x
	palliata alba Currier, Mss			x	x	
47	Vallonia pulchella Mull		x			x
	minuta Say			x	x	
48	costata Muller					x
49	excentrica Sterki					x
50	Strobilops labyrinthica Say		x	x	x	x
51	virgo Pils					x
52	Pupa muscorum L.					x
53	fallax Say			x		x
54	edentula simplex Gld		x	x	x	x
55	corticaria Say				x	x
56	armifera Say		x	x	x	x
57	contracta Say		x	x	x	x
58	curvidens Gld					x
59	pentodon Say		x	x	x	x
60	milium Gld			x	x	x
61	Vertigo decora Gld * 7				x 3	
62	ovata Say	x	x		x	x
63	Gouldii Binn		x	x 2	x	x
64	Bollesiana Morse					x
65	ventricosa Morse				x	x
	ventricosa elatoir Sterki					x
66	tridentata Wolf					x
67	Morse Sterki					x
68	Ferussacia subcylindrica L			x	x	x
	lubrica Mull		x	x 2		
69	Succinea aurea Say				x 3	
70	avara Say		x	x	x	x
	vermeta Say		x	x	x	
71	campestris Say* 8	x	x			
72	obliqua Say		x	x	x	x
	ovalis Say	x	x			
73	ovalis Gld			x	x	x
	ovalis DeCampii Tryon			x	x	x
	ovalis Higginsi Bld?* 9					x
	ovalis Peoriensis Wolf Mss.				x	x
74	Carychium exiguum Say		x	x	x	x
75	exile H. C. Lea					x
76	Limnæa stagnalis L	x		x	x	x
	appressa Say		x	x 2		
	stagnalis jugularis Say		x			x
	stagnalisSanctæ-MariæWalker					x
77	ampla Migh			x	x	x
78	decollata Migh			x	x	x
79	megasoma Say			x	x	x
80	reflexa Say		x	x	x	x
	umbrosa Say		x		x	
	reflexa zebra Tryon			x	x	x
	reflexa exilis Lea					x
	reflexa scalaris Walker					x
	reflexa distortus Rossm* 10					x
	reflexa Kirtlandiana Lea					x
81	desidiosa Say	x	x	x	x	x
82	emarginata Say			x	x	x
83	catascopium Say			x	x	x
84	caperata Say		x	x	x	
85	Cubensis Pfr					x
	umbilicata Ads		x	x 2	x 3	x
86	pallida Ads		x	x	x	
87	humilis Say			x	x	x
	modicellus Say		x	x 2		

		S	M	C	D	W
88	Limnæa palustris Mull			x	x	x
	elodes Say	x	x	x 2		
	fragilis L.				x	
	intertexta, Currier Mss 11			x	x	
	palustris Michiganensis Wkr.					x
89	lanceata Gld			x	x	x
90	columella Say	x	x	x	x	x
91	contracta Currier			x	x	x
92	galbana Say?					x
93	bulimoides Lea* 12				x	
94	gracilis Jay		x	x	x	x
95	Binneyi Tryon* 13			x	x 3	
96	Haydeni Lea* 14				x 3	
97	Traskii Tryon* 14				x 3	
98	Physa Lordi Bd				x	x
	Parkeri Currier			x	x	
99	gyrina Say			x	x	x
	elliptica Lea				x	
	oleacea Tryon			x	x 3	
	Febigeri Lea				x 3	
	gyrina Hildrethiana Lea		x	x		x
100	heterostropha Say	x	x	x	x	x
101	Sayii Tappan					x
	Sayii Warreniana Lea			x	x	x
102	vinosa Gld		x	x	x	x
103	anatina Lea					x
104	ancillaria Say			x	x	x
105	pomilia Showalteri Lea				x	x
106	brevispira Lea					x
107	deformis Currier			x	x	
108	integra Hald			x	x	x
	Niagarensis Lea			x	x	
109	Aplexa hypnorum L			x	x	x
	elongata Say	x	x	x 2		
	hypnorum Tryoni Currier			x	x	x
	hypnorum glabra DeKay 15					
110	distorta Hald				x	
111	sp					x
112	Planorbis lentns Say* 16		x			
113	trivolvis Say	x	x	x	x	x
	corpulentus Say				x 3	
	regularis Lea			x	x	
114	truncatus Miles		x	x	x	x
115	campanulatus Say	x	x	x	x	x
	campanulatus minor Dkr			x	x	x
116	multivolvis Case			x	x	x
117	bicarinatus Say	x	x	x	x	x
	bicarinatus major Walker					x
	bicarinatus corrugatus Currier Mss			x	x	x
	bicarinatus Aroostookensis Pils					x
118	exacutus Say		x	x	x	x
	exacuus Say	x				
	exacutus rubellus Sterki					x
119	albus Mull				x	x
120	parvus Say		x	x	x	x
121	deflectus Say		x	x	x	x
122	costatus DeTar & Beecher Mss 17					
123	Segmentina armigera Say		x	x	x	x
124	Wheatleyi Lea					x
125	Ancylus rivularis Say				x	
126	fuscus Ad		x	x	x	x
127	parallelus Hald		x	x	x	x
128	diaphanus Hald				x	x
129	tardus Say		x			x
130	Valvata tricarinata Say	x	x	x	x	x
	tricarinata bicarinata Lea				x	x
	tricarinata unicarinata DeKay				x	
	tricarinata simplex Gld				x	x
131	sincera Say	x	x	x	x	x

		S	M	C	D	W
	Valvata sincera striata Lewis			x		x
	sincera Lewisii Currier			x	x	
132	humeralis Say* 18		x			
133	Vivipara contectoides W. G. Binney* 19					
134	Campeloma ponderosa Say* 20	x	x	x		
135	decisa Say	x	x	x	x	x
	decisa flava Currier Mss.					x
	decisa melanostoma Currier Mss.					x
	decisa heterostropha DeKay				x	x
136	integra Say		x	x 2	x	x
137	rufa Hald		x	x	x	x
	rufa gibba Currier			x	x	x
138	obesa Lewis		x		x	x
139	subsolida Anth				x	x
	subsolida Milesii Lea				x	x
140	Lioplax subcarinata Say* 21					x
141	Bythinia tentaculata L.				x 3	x
142	Bythinella attenuata Hald				x	x
143	tenuipes Couper* 22				x	
144	Binneyi Tryon 23				x	
145	Nicklinana Lea				x	
146	obtusa Lea				x 3	x
147	Somatogyrus isogonus Say		x	x	x	x
148	Amnicola limosa Say				x	x
	porata Say				x	x
	pallida Hald		x	x	x	x
149	grana Say		x	x 2	x	x
	granosa Say			x		
150	Cincinnatiensis Anth				x	x
151	decisa Hald				x	
152	lustrica Pils				x	x
153	Lyogyrus pupoideus Gld				x	x
154	Pomatiopsis lapidaria Say		x	x	x	x
155	Cincinnatiensis Say					x
156	Pleurocera subulare Lea			x	x	x
	subulare intensum Anth				x	x
157	neglectum Anth		x	x 2	x	x
158	elevatum Say				x	x
159	labiatum Lea				x	
160	pallidum Lea				x	
161	Goniobasis livescens Mke		x	x	x	x
	Niagarensis Lea		x	x 2		
	livescens cuspidatus Anth				x 3	x
162	translucens Anth				x 3	x
163	brevispira Anth				x 3	x
164	pulchella Anth		x	x 2	x	
165	depygis Say	x	x		x 3	x
166	Milesii Lea			x	x	x
167	gracilior Anth				x 3	
168	semi-carinata Say					x
169	Virginica Gml.* 24	x	x			
170	Unio alatus Say	x	x	x	x	x
171	anodontoides Lea* 25				x 3	
172	asperimus Lea				x	x
173	borealis Gray					x
174	cælatus Con* 26	x	x			
175	Canadensis Lea					x
176	cariosus Say* 27	x	x			
177	circulus Lea	x	x		x	x
178	coccineus Hild		x	x	x	x
179	complanatus Sol		x		x 3	x
	purpureus Say	x				
180	cornutus Bar			x	x	x
181	cuneolus Lea* 28				x 3	
182	donaciformis Lea					x
183	elegans Lea		x	x	x	x
184	ellipsis Lea		x	x	x	x
	olivarius Raf.	x				
185	ellipsiformis Con 29					
186	fabalis Lea					x

		S	M	C	D	W
	Unio *lapillus* Say	x	x			
187	gibbosus Bar.		x	x	x	x
	dilatatus Raf.	x				
188	glans Lea.		x	x	x	x
189	gracilis Bar.		x	x	x	x
	fragilis Raf.	x				
190	iris Say* 30	x	x	x	x	
191	Kirtlandianus Lea 31					
192	lævissimus Lea		x	x	x	
193	Leibii Lea					x
194	latecostatus Lea* 32				x	x
195	ligamentlnus Lam.		x		x	x
	crassus Say			x 2	x 3	
196	luteolus Lam.		x	x	x	x
	siliquoideus Bar.	x			x 3	
197	multiradiatus Lea	x	x		x 3	x
198	nasutus Say	x	x		x	x
199	negatus Lea* 33					x
200	novi-eboraci Lea		x	x	x	x
	opalinus Anth.			x	x	
201	occidens Lea		x	x	x	x
202	parvus Bar.		x	x	x	x
203	penitus Con* 34	x	x			
204	perplexus Lea* 35		x			
	gibbosus Raf:	x				
205	phaseolus Hild		x	x	x	x
	fasciolaris Raf.	x				
206	plicatus Les.	x	x	x	x	x
207	pressus Lea		x		x	x
	compressus Lea	x				
208	pustulatus Lea* 36					x
209	pnstulosus Lea					x
	bullatus Raf.	x	x			
210	radiatus Lam* 37					
	distans Anth.			x	x	
211	Rangianus Lea					x
212	rectus Lam.	x	x	x	x	x
	leprosus Miles		x	x	x	
	Sageri Con 38					
213	rubiginosus Lea	x	x	x	x	x
214	Schoolcraftii Lea		x	x	x	x
	prasinus Con			x 2		
215	spatulatus Lea		x	x	x	x
216	subovatus Lea* 39		x	x	x	
217	subrotundus Lea* 40	x	x			
218	sulcatus Lea					x
	perplexus perobliquus Con. 41					
219	Tappanianus Lea* 42				x 3	
220	tenuissimus Lea		x	x	x	x
221	trigonus Lea		x	x	x	x
222	triangularis Lea	x	x	x	x	x
223	undulatus Bar.	x	x		x 3	x
224	ventricosus Bar	x	x	x	x	x
225	verrucosus Bar		x	x	x	x
	tuberculatus Raf.	x				
226	Margaritina complanata Bar.			x	x	x
227	deltoidea Lea		x	x	x	x
228	Hildrethiana Lea	x	x	x	x 3	x
229	marginata Say	x	x	x	x	x
220	rugosa Bar.		x	x	x	x
231	undulata Say* 43	x				
232	Anodonta Benedictii Lea		x	x 2	x	x
233	Buchanensis Lea* 44			x 2		
234	corpulenta Cpr.				x 3	x
235	decora Lea					
	inornata Anth.			x	x	
236	edentula Say	x	x	x	x	x
	edentula rhombica Anth.			x	x	x
237	ferruginea Lea				x 3	
238	Ferussaciana Lea	x	x	x	x	x
239	fluviatilis Dillw* 45		x		x 3	

MoU

			S	M	C	D	W
	Anodonta	*cataracta* Say	x	x		x 3	
240		Footiana Lea		x	x 2	x	x
		McNeillii Anth			x	x	x
		Footiana opalina Anth				x	x
241		fragilis Lam				x 3	x
		flava Anth				x	
		glandulosa Anth			x	x	
		imbricata Anth				x	x
		irisans Anth			x	x	x
		pallida Anth		x	x	x	
		subcarinata Currier			x	x	x
242		imbecilis Say		x	x	x	x
243		lacustris Lea* 45				x 3	
244		Marryatana Lea				x 3	x
		Houghtonensis Currier			x	x	x
		subinflata Anth			x	x	
245		modesta Lea		x	x	x	x
246		ovata Lea		x	x	x	x
		subangulata Anth			x	x	
247		Pepiniana Lea* 46		x	x 2	x 3	x
248		plana Lea		x	x	x	x
249		salmonia Lea			x	x	x
250		Schæfferiana Lea		x	x	x	
251		Simpsoniana Lea					x
252		subcylindracea Lea		x	x	x	x
253		subgibbosa Anth			x	x	x
254	Sphærium	simile Say	x				x
		sulcatum Lam		x	x	x	x
255		aureum Prime				x 3	
256		solidulum Prime		x	x	x	x
		distorta Prime			x 2		
257		striatinum Lam		x	x	x	x
258		rhomboideum Say			x	x	x
259		fabale Prime 51			x	x	
260		occidentale Prime		x	x	x	x
261		emarginatum Prime			x 47	x	
262		flavum Prime			x 47	x	
263		partumeium Say		x	x	x	x
264		Jayanum Prime			x 47	x 47	x 50
265		sphæricum Anth					x
266		transversum Say				x 3	x
267		securis Prime				x 3	x
		securis crocea Lewis					x
268		truncatum Lind				x	x
269		Vermontanum Prime				x	
270		rosaceum Prime				x	x
271		stamineum Con				x	x
272		tenue Prime				x	
273	Pisidium	Virginicum Bgt,		x	x	x	x
		dubium Say			x		
		dubiosa Say	x				
274		Adamsi Prime 48			x	x	
275		compressum Prime		x	x	x	x
276		abditum Hald		x	x	x	x
		abditum abyssorum Stimp Mss* 49					
277		rotundatum Prime			x 47	x	x
278		variabile Prime				x	x
279		ventricosum Prime		x	x	x	x
280		noveboracense Prime				x 3	x
281		æquilaterale Prime					x
282		Idahoense Roper					x
283		milium Held					x
284		punctatum Sterki					x

NOTES.

1. This list is intended to give every species, which has at any time been quoted in any of the formal lists of the state, and such scattering citations of other species as have been found elsewhere, with the name, synonymous or otherwise, given in the original citation. The accepted nomenclature is printed in plain type, synonyms in italics, species considered doubtful are asterisked. The four columns headed respectively S. M. C. and D., contain the species given in the catalogues of Sager, Miles, Currier and DeCamp. In the DeCamp column are included certain species included in my catalogue of 1892, upon the authority of a supplemental written list furnished by Dr. DeCamp for that purpose. In the Currier column certain species are included, given in his "Catalogue of Grand Rapids Shells," but not included in his general catalogue of 1868, probably because he became satisfied that the citation was erroneous or synonymous. In the fifth column, headed W, are included all species vouched for by myself, either in my former lists or in the present one. Unless otherwise specified, these citations are based upon specimens in my collection.

2. Cited in "Grand Rapids" catalogue of 1865 only.

3. Cited in supplemental list only.

4. See Nautilus VII, p. 126, for the circumstances under which this species was found.

5. Has not been found by any recent collector and for the present must be considered doubtful.

6. Leach's name was never published but is cited by Pilsby, Manuel IX, p. 76.

7. The specimens thus cited have been recently described by Sterki as a new species under the name of *V. Morsei*, Nautilus VIII, p. 89.

8. Undoubtedly erroneous as the species is confined to the southern region.

9. It is doubtful whether this identification is correct, although specimens have been received under this name said to have been identified by Dr. James Lewis. The form thus designated is a well marked one and seems to be generally distributed through the northern part of the state.

10. The scalariform variety was originally cited by me under this name by mistake.

11. Never described. Said by Dr. DeCamp to be a form of *L. palustris* Mull.

12. Said by Dr. DeCamp to have been found in a greenhouse. It is a western species.

13. Probably erroneous as the species is a western one. A specimen received from Dr. DeCamp under this name is a form of *L. ampla* Migh.

14. Probably erroneous. A purely western species.

15. Cited by Clessin, *Limnæidæ* p. 287.

16. Very doubtful.

17. Has not yet been published. From a drawing kindly furnished by Mr. Beecher, it appears to be closely related to the European *P. nautileus* L.

18. Undoubtedly erroneous as Say's species is Mexican. Miles received his specimen from Currier (Cat. p. 238) and the form is probably that subsequently described as *V. striata* Lewis.

19. Very doubtful, as it has never been found by any of the local collectors. But it may occur along the southern border of the state. Cited only by Haldeman and Binney.

20. Doubtful. Has never been found by any of the recent collectors.

21. Cited upon the authority of Dr. M. L. Leach, who states that a single specimen from Higgins' Lake, Roscommon County, was so identified by Tryon. I think it must be considered as doubtful until its occurance in Michigan is verified.

22. Cited by Dr. DeCamp, who states that his specimens were identified by

Tryon. The species is a southern one and has not, I believe, been found in any intermediate locality.

23. The species is a Californian one and the identification must be considered doubtful. Specimens received from Dr. DeCamp evidently belong to a different species from any other found in the state and it may be a new one.

24. Clearly erroneous as the species is confined to the Atlantic drainage. As *Pleurocera subulare* Lea is not cited by either Sager or Miles, it seems probable that that is the species referred to.

25. Doubtful. A specimen received from Dr. DeCamp is a rayed *U. rectus* Lam. Cited also by Call (Geo. Cat.), but he informs me that his citation was based solely on information received from Dr. DeCamp.

26. Undoubtedly erroneous as the species is purely a southern one.

27. This species is confined to the Atlantic drainage. The specimens were probably some form of *U. occidens* Lea.

28. Doubtful. A Tennessee species.

29. Monography of the Unionidae p. 60.

30. Cited also by Call. (loc. cit.) *U. novi-eboraci* Lea?

31. Cited by Call (loc. cit.)

32. Doubtful. See Nautilus VI, p. 44.

33. Doubtful. See Nautilus VI, p. 44. The specimen from my own collection there mentioned has been referred to *U. coccineus* Hild. by Mr. C. T. Simpson.

34. Very doubtful. A southern species.

35. Doubtful. Has not been found by any of the recent collectors. *U. Rangianus* Lea may have been the species intended.

36. Cited under an erroneous identification.

37. This species in the United States is confined to the Atlantic drainage. It has, however, been cited from the shore of Lake Superior by Gould and from Manitoba by Christy (J. of C. IV, p. 344) and may be found in the Upper Peninsula. But it must be cited as doubtful until its occurrance is clearly proved. *Unio distans* Anth., although referred to this species, is more likely to be a form of *U. luteolus* Lam.

38. Monography of the Unionidae, p. 58.

39. Doubtful. Specimens received under that name prove to be *U. ventricosus* Bar.

40. Not found by any recent collector. *U. ventricosus* Bar.?

41. Monography of the Unionidae, p. 51.

42. Specimens received from Dr. DeCamp under this name prove to be a small form of *U. luteolus* Lam.

43. Undoubtedly erroneous as the species is peculiar to the Atlantic drainage. As *M. rugosa* Bar. is not cited by Sager, that is probably the species intended.

44. As this species was not included by Currier in his later catalogue, it is probably a mistake.

45. Very doubtful as the species is an eastern one, probably specimens of *A. fragilis* Lam. were in view.

46. Doubtful. See Nautilus VI, p. 65.

47. Cited from "Lake Superior" probably from original description of Prime. The original locality of *S. flavum*, however, is given as Sault Ste. Marie.

48. Specimens from Holly are cited by Prime in his original description.

49. Not described. Quoted by Smith in his "Sketch of the Invertebrate Fauna of Lake Superior."

50. The citation of this species in my catalogue of 1879 from Houghton Lake is probably erroneous.

51. The citation of this species in my former lists was an error, the specimens having proved to be a form of *S. simile* Say.

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